Measuring chemical abundances in AGN from infrared nebular lines: HII-CHI-Mistry-IR for AGN.

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Abstract

Future and on-going infrared and radio observatories such as JWST, METIS or ALMA will increase the amount of rest-frame IR spectroscopic data for galaxies by several orders of magnitude. While studies of the chemical composition of the ISM based on optical observations have been widely spread over decades for Star-forming Galaxies (SFG) and, more recently, for Active Galactic Nuclei (AGN), similar studies need to be performed using IR data. This regime can be especially useful in the case of AGN given that it is less affected by temperature and dust extinction, traces higher ionic species and can also provide robust estimations of the chemical abundance ratio N/O. We present a new tool based on a bayesian-like methodology (HII-CHI-Mistry-IR) to estimate chemical abundances from IR emission lines in AGN. We use a sample of 58 AGN with IR spectroscopic data retrieved from the literature, composed of 43 Seyferts, 8 ULIRGs, 4 LIRGs and 3 LINERs, to probe the validity of our method. The estimations of the chemical abundances based on IR lines in our sample are later compared with the corresponding abundances derived from the optical emission lines in the same objects. This tool takes advantage of photoionization models, characterized by the chemical abundance ratios O/H and N/O and the ionization parameter U, to compare their predicted emission-line fluxes with a set of observed values. We report mainly solar and also subsolar abundances for O/H in the nuclear region for our sample of AGN, whereas N/O clusters around solar values. We find a discrepancy between the chemical abundances derived from IR and optical emission lines. This discrepancy, also reported by previous studies of the composition of the ISM in AGN from IR observations, is independent from the gas density or the incident radiation field to the gas, and it is likely associated with dust obscuration and/or temperature stratification within the gas nebula.

My poster is available at https://zenodo.org/record/7042846#.Y_YE-oDMJuQ